Weighing the snow core to determine the water content

FEDERAL-STATE COOPERATIVE SNOW SURVEYS AND IRRIGATION WATER FORECASTS

for

MISSOURI and ARKANSAS DRAINAGE BASINS

APRIL 1, 1945

Division of Irrigation, Soil Conservation Service
United States Department of Agriculture
and
Colorado Agricultural Experiment Station

Data included in this report were obtained by the agencies named above in cooperation with the U. S. Forest Service, National Park Service, State Engineers of Colorado, Wyoming and New Mexico and other Federal, State and local organizations.

42-12-13-87

Fort Peck
Res. 59%

12-3-6-43

27-7-8-68

36-9-10-42

47-14-19-70

34-9-10-33

15-3-5-84

29-7-8-41

23-6-4-14

44-13-14-59

24-6-6-33

23-6-7-77

31-9-10-38

41-12-13-X

APRIL 1, 1945

37-10-11-X

66-23-19-21

51-14-12-23

Kingsley
Res. 38%

57-20-18-X

54-20-17-X

42-13-13-31

39-11-11-56

43-13-12-37

54-18-17-57

32-10-10-27

50-14-14-X

39-13-10-29

47-16-15-7

49-17-15-44

Lake Mead
60%

30-10-7-58

22-7-5-28

5-2-1-56

7-2-1-11

Elephant Butte
Res. 57%

April 1, 1945

WATER SUPPLY OUTLOOK

MISSOURI-ARKANSAS DRAINAGE BASINS

The water supply outlook for the North Platte valley is very good. For the South Platte valley reservoir storage is generally below normal but near normal runoff is expected from the snow cover in the mountains. The outlook in the Arkansas valley is good. Runoff from the watershed will be about normal and reservoir storage is exceptionally high. Water supply conditions are not so favorable on the Missouri River and its tributaries in Montana and some water shortages will occur unless considerably more snow and rain fall during April, May and June.

MISSOURI RIVER AND TRIBUTARIES IN MONTANA

JEFFERSON: The water supply outlook for the Jefferson has improved during March with an added 1 inch of water in the snow over the watershed. The water content is now about 9 inches on the average and 90 percent of the 10-year mean. The prospects are favorable for a satisfactory irrigation water supply for the season of 1945.

MADISON: Likewise for this drainage the March storms increased the average water content of the snow slightly more than 1 inch bringing the total to 14½ inches. The present condition is better than it was a year ago but still considerably under normal. The outlook is not especially bright for a satisfactory runoff this coming season. There is a probability that there will be a moderate shortage in the irrigation supply during the later part of the coming season. Reservoir storage improved during March and at present is quite satisfactory. It can be reasonably expected that during the spring thaw additional storage will be realized. Hebgen Reservoir now holds 227,000 acre feet at two-thirds capacity.

GALLATIN: The outlook for the coming irrigation season's irrigation supply improved during March. The present water content of the snow averages 8½ inches which is about 1 inch under normal. Soil moisture throughout this valley is generally fair and stream flow below normal. The snow cover is fairly good on the headwaters of this river with prospects of ample water during the early part of the irrigation season. It is quite probable that April and May storms will add to the snow cover on the headwaters of this drainage which will sustain the flow for a satisfactory water supply into late summer.

MARIAS: The irrigation water supply prospects for this season improved materially for the Marias drainage during March. The average water content of the snow is now essentially normal and points to a satisfactory runoff

for 1945. No water shortage is anticipated at this time. It is fully expected that the principal storage reservoirs on this drainage will be filled to overflowing during the spring and early summer high flow of the streams.

MISSOURI: (Between Helena and Great Falls). For this section of the Missouri drainage the snow cover contains on the average about 7 inches of water which is about three-quarters of an inch under normal. March storms added nearly two inches to the snow-water storage in this section of the drainage area. For the upper Missouri and its several tributaries the outlook is somewhat better than a month ago and in general the situation indicates that the runoff for this season will be slightly under normal. No marked deficiencies in the irrigation supply may be expected, however, for some of the principal tributaries water for late irrigation may be somewhat under the average supply, particularly for the Madison.

YELLOWSTONE: The water content of the snow on the headwaters of the Yellowstone increased 1½ inches on the average during the past month to a present total of nearly 7½ inches. This amount is one inch under the normal. The prospects now are that the runoff will be at least 10 percent below normal this season. In the Yellowstone Park, at the Lewis Lake Divide snow course, March storms added 4 inches of water to the snow pack. On the headwaters of the Yellowstone, in the National Park, the additional water in the snow over the past month has improved the general outlook for the coming summer runoff.

MILK RIVER: The present average water content of the snow on the headwaters of this stream is only three inches. The past 10-year average is about 5½ inches. Because of the deficiency of water in snow storage the outlook of the coming season's runoff is rather disappointing at this time. In all probability the water supply for irrigation will not exceed three-quarters of the normal.

SHOSHONE RIVER: For this drainage the snow pack is substantially normal at this time and the irrigation supply is expected to be ample. The Shoshone Reservoir, near Cody, now has in storage 270,000 acre-feet of water and is at about 60 percent of capacity. The potential water in the snow on the headwaters of both forks of the river which feeds this large lake will be sufficient to fill this reservoir to full capacity durin the spring runoff. On the Shoshone Project, near Powell, Wyoming, the soil moisture is good and farming operations are well underway. The favorable prospects for runoff and the expected full reservoir assures an ample irrigation supply for 1945.

BIG HORN RIVER: The outlook for the coming season's irrigation water supply for the Big Horn and its tributaries is fairly good at this time. The average water content of the snow cover on the headwaters of these streams is now 9 inches which is the same as it was last year at this time. Most of the recent snow surveys on this drainage were made prior to the general storm over this region of Wyoming and for this reason the outlook has been improved materially since April first. The combined storage in Bull Lake and Pilot Butte reservoir is now 71,000 acre-feet, last year at this time the amount held was 101,000. At present the filling in these two lakes is only about 40 percent of capacity. Generally the

agricultural areas, served by water from the Big Horn and its tributaries, have been snow covered most of the winter and where melted, has been absorbed in the soil. The soil moisture is therefore good and will improve as the spring advances. Range and crop conditions are reported to be good. The expected season's water supply for the entire Big Horn basin will be somewhat below normal this year unless heavy April and May storms cover this drainage basin. The coming spring thaw will provide storage for near capacity filling in these two reservoirs and provide an ample supply for the project lands in the vicinity of Riverton. There is some likelihood of a moderate shortage in water supply during the late summer for areas along the main river north of Thermopolis.

TONGUE RIVER: On this watershed the water content of the snow is now more than 6 inches and about 3 inches above the past 10-year average. The March storms in this section of Wyoming added materially to the snow cover and the prospects for the coming irrigation season's water supply are now exceptionally good. Soil moisture and range conditions also are reported to be good.

POWDER RIVER: The outlook for an adequate irrigation water supply this summer is now fairly promising. The snow cover on the watershed is practically normal and the present conditions almost identical with that of a year ago.

CHEYENNE RIVER: There has been a small increase in the water content of the snow in the Black Hills during March. This area has been snow covered all winter and the farming operations are now just starting. Soil moisture is excellent, in some places too wet for cultivation. The spring runoff has already started and some of the tributary streams are at high stage. The Belle Fourche Reservoir now has in storage 136,000 acre feet of water which is more than three-quarters full. There is little doubt as to the filling of this reservoir to full capacity before the start of the irrigation season. The outlook for the season's water supply is satisfactory, especially for the project area. Other lands dependent upon direct flow from this stream and its tributaries may experience a moderate shortage after midsummer.

NORTH PLATTE RIVER: Since early in February the snow cover over this drainage has made great improvement. During February the average increase in the water content of the snow was nearly 6 inches and for the month of March the increase was more than 6½ inches bringing the total up to 20 inches by April 1st. A recent general storm has added further to the snow cover on the headwaters of this river and its tributaries. The prospects for the irrigation water supply this coming summer are exceptionally good and can be stated as the best over the past several years. The estimated flow of the North Platte at Saratoga, Wyoming, will be 525,000 acre-feet for the period April-July 1945. The combined storage in the four principal reservoirs on this stream in Wyoming is now 481,000 acre-feet as compared with 587,000 a year ago at this time. The very favorable prospect for the coming season's runoff is expected to result in a total storage of 1,100,000 acre-feet in these reservoirs by about July 1st, 1945. The Kingsley-Sutherland Reservoirs in the lower valley in Nebraska, now have in storage a total of 830,000 acre-feet, having accumulated about 50,000 during the past month. The storage a year ago in these two reservoirs was 786,000 acre-feet. Throughout the entire North Platte valley the soil moisture is good to excellent and the water crop prospects for 1945 are unusually good at this time.

SWEETWATER RIVER: Like other tributary streams to the North Platte this drainage is expected to have an above-normal runoff this season due to the recent heavy storms subsequent to the snow surveys made on this watershed. The estimated runoff into Pathfinder Reservoir will be 85,000 acre-feet during the April-July, 1945 period.

LARAMIE RIVER: The month of March brought an additional 4 inches of water to the snow pack on the headwaters of this stream which now totals nearly 14 inches on the average. This amount is 2 inches above the past 10-year mean and now presents an optimistic outlook for the coming season's water supply. The present condition is perhaps the best in several years and there will be ample water for all irrigation needs and sufficient to fill the Wheatland Reservoirs to full capacity. At Brooklyn Lake, headwaters of the Little Laramie the water content of the snow is 23 inches. The average depth of snow is about 6½ feet. Throughout the Laramie River valley the soil moisture is good, stream flow is improving. The range lands are snow covered and the snow melt from the cover at lower elevations will provide an earlier runoff than usual. The runoff at Jelm, on the main Laramie River, for the April-July period is estimated to be 75,000 acre-feet.

SOUTH PLATTE RIVER BASIN

CACHE LA POUDRE: During March, on the headwaters of the Poudre and its tributaries the water content of the snow gained 2 inches bringing the total to an average of 12½ inches. Last year on April 1st it was 10 inches. The recent snow survey on Cameron Pass found the snow to contain 19 inches of water, at Lake Irene, the source area of the Big South, there is 18 inches of water in the snow and on Deadman Hill it is 14½. Over the drainage area of the Poudre conditions are normal due largely to the storm occurring in the mountain sections of northern Colorado at the first of this month. The reservoir storage in the Poudre Valley and mountain reservoirs now totals about 34,000 acre-feet, last year at this time it was 48,000. Soil moisture is slightly subnormal but much improved since April first. Ice in the streams is going out and the valley reservoirs are open. Farming operations are underway. The prospects of the coming season's water supply for irrigation are relatively good. It is expected that the spring runoff will provide ample water to supply direct demands for irrigation and in addition sufficient water to practically fill all the reservoirs. The stage of the river will rise somewhat earlier this spring and be normal until midsummer. The river supply will be below normal in August and September. The estimated flow of the Poudre, April-July, 1945 will be 215,000 acre-feet which is normal for this 4-month period of the runoff.

BIG THOMPSON: The water content of the snow cover on the water shed of this stream and its tributaries increased 2 inches during the past month to a total of about 14¼ inches. This is only slightly under the 10-year average. The water supply outlook is now very favorable and because of a normal snow cover and the storage in reservoirs throughout the valley at much above the average, the irrigation needs of 1945 are well assured. The soil moisture throughout the farming area is deficient at this time but has improved since the first of the month. Stream flow is improving. The crop conditions particularly winter wheat, are only fair and because of the

dry fall and winter this crop may not be normal this season. The Big Thompson is expected to flow 95,000 acre-feet during the April-July, 1945 irrigation period.

ST. VRAIN: For this watershed the snow pack now contains 13 inches of water which is normal. During March the gain was 3½ inches. The soil moisture over the farming districts served by this stream is subnormal as it is generally throughout the irrigated areas in northern Colorado. Reservoir storage in the valley is somewhat below average at this time but because of the potential water in snow storage most of the reservoirs are expected to fill by June 15th. The general prospects for an adequate irrigation supply for this season are quite favorable. The St. Vrain will be at normal stage until about July 15th and it is likely that during late summer the flow will be less than average for this period of the irrigation season. For the April-July period the flow of the river at Lyons is estimated to be 75,000 acre-feet.

BOULDER CREEK: The present irrigation water supply outlook for the coming season is very favorable. March storms on this watershed added 2 inches to the average water content of the snow cover which now totals 12 inches. The snow water storage is at present one inch above normal. Reservoir storage in the Boulder Valley is now the same as last year at this time and it is expected that the spring flow will be sufficient in providing for the filling of practically all the reservoirs served by this stream and its several tributaries. Soil moisture over the irrigated area is reported to be fair. Farming operations are now well underway.

CLEAR CREEK: March storms on the headwaters of this stream increased the snow-water content nearly 4 inches to a total of about 14½ inches which is now normal. The outlook for this season's water supply continues to be very favorable and there is little doubt as to ultimate filling of the storage reservoirs by mid June. The present storage in the vicinity of Denver is now the same as it was a year ago at this time. Soil moisture throughout the farming districts served by Clear Creek water is fair and the general crop conditions are reported to be fairly good in spite of deficiencies in precipitation during the late fall and winter months. The estimated flow of Clear Creek at Golden, for the coming April-July period is 125,000 acre-feet.

SOUTH PLATTE: Generally for the South Platte basin as a whole the outlook for the coming season's irrigation water supply is fairly promising. Reservoir storage in the lower valley is practically the same as last year. Full capacity in these reservoirs will be realized by June 15th. The soil moisture throughout the valley from Fort Morgan east to the State Line is good and farming operations now well advanced. There will be no shortage of the irrigation supply in the lower valley this season.

ARKANSAS RIVER

On the headwaters of this drainage the April first water content of the snow averages 10 inches which is normal for this time of year. The prospects for a near-normal runoff from the snow pack are quite certain, however, the mountain areas have below normal soil moisture which will tend to reduce the water yield below the expected amount as based on the present water in snow storage. The discharge of the river at Salida is estimated to be 215,000 acre-feet for the coming April-July period. This flow being about 10 percent less than the normal. In the Arkansas Valley and mountain reservoirs there is now a total storage of about 360,000 acre-feet. In the Great Plains reservoirs, north of Lamar, the combined storage exceeds 100,000 acre feet and in the John Martin reservoir, near Las Animas, there is 55,000. This large amount of stored water is probably the most on record. Since the runoff from the snow cover is anticipated to be near normal together with the very substantial amount of supplemental water in storage, there appears full assurance of an ample irrigation water supply this coming season. Throughout the irrigated valley areas the soil moisture is fair to good and planting is progressing very satisfactorily.

The prospects for the water supply in the Purgatoire are quite promising. It is probable that the runoff will be slightly below normal. In the Trinidad irrigated area the soil moisture is good and the range and crop conditions are reported to be very good. Storage in the Model Reservoir is 3,700 acre-feet which is the same amount held last year at this time.

The runoff in the Fountain will probably be subnormal this season. The soil moisture is deficient at this time throughout the Fountain Valley and crop conditions are only fair. Reservoir storage is the same as it was a year ago. The available water for irrigation will be ample until about July first and is expected to be short for the rest of the season.

SNOW SURVEYS AND IRRIGATION WATER FORECASTS
FOR MISSOURI AND ARKANSAS RIVERS
April 1, 1945

PRECIPITATION DATA

WATERSHED	STATE	Precipitation October 1 to March 31	Departure from Normal	Precipitation March	Departure from Normal
		Inches	Inches	Inches	Inches
Missouri	East. Mont.	2.82	-0.83	1.09	+0.29
Missouri	Cent. Mont.	3.14	-1.42	0.84	-0.02
Missouri	North. Wyo.	8.14	-0.20	1.69	+0.20
North Platte	Wyoming	5.18	+0.38	1.74	+0.56
South Platte	Colorado	4.90	-1.84	0.92	-0.62
Arkansas	Colorado	5.17	-1.37	1.02	-0.48

Precipitation in Wyoming and Eastern Montana was above normal during March. It was below normal in Colorado on the watershed of the South Platte and Arkansas. However, the accumulated precipitation from October 1 to March 31, is still below normal on all watersheds except the North Platte.

SUMMARY OF APRIL 1 SNOW SURVEYS AND COMPARISON OF DATA WITH THAT OF PREVIOUS YEARS BY WATERSHEDS

WATERSHEDS	Snow Depth			Water Content			Number Courses in Average	Snow Density			1945 Water Content in percent of	
	Ten year Avg.*	1944	1945	Ten Year Avg.*	1944	1945		Ten Year Avg.*	1944	1945	Ten year Avg.*	1944
	In.	In.	In.	In.	In.	In.		Percent	Percent	Percent		
MISSOURI RIVER												
Jefferson River	33.0	31.3	33.5	10.0	8.0	9.2	7	30	26	27	92	115
Madison River	52.9	46.2	47.3	18.9	13.6	14.4	7	36	29	30	76	106
Gallatin River	34.0	41.3	35.5	9.7	10.4	8.6	7	28	25	24	89	83
Musselshell River	18.7	15.1	14.6	4.6	4.2	3.4	2	25	28	23	74	81
Missouri River**	28.8	23.3	27.4	7.7	7.2	6.9	11	27	25	25	90	96
Marias River	37.6	31.7	42.4	12.7	9.0	12.5	2	34	28	29	98	139
Yellowstone River	29.9	32.2	29.4	8.4	7.9	7.3	7	28	24	25	87	92
Milk River	16.6	20.1	11.8	5.6	7.1	3.1	1	34	35	26	55	44
Shoshone River	48.0	45.1	43.7	13.9	12.2	13.0	3	29	27	30	93	106
Bighorn River	35.8	36.4	31.3	10.2	9.3	9.1	11	29	26	29	89	98
Tongue River	16.2	27.2	22.9	3.7	5.1	6.3	1	23	19	27	170	123
Powder River	26.0	30.2	23.6	5.8	5.7	5.6	2	22	19	24	96	98
North Platte River	57.7	56.8	66.5	18.9	14.3	20.4	10	33	25	31	108	142
Sweetwater River	39.7	43.6	36.6	11.0	12.0	10.2	2	28	28	28	93	85
Laramie River	39.2	41.1	50.9	11.8	10.1	13.8	8	30	25	27	117	137
Cheyenne River	27.5	32.4	22.6	6.9	8.2	5.5	3	25	25	24	80	67
South Platte River***	22.3	24.4	18.9	5.9	5.5	4.8	3	26	23	25	81	87
Crow Creek	16.0	25.7	32.2	4.5	6.0	8.1	1	28	23	25	180	135
Poudre River	40.9	39.5	46.5	12.6	9.8	12.6	5	31	25	27	100	129
Big Thompson River	50.2	47.6	46.2	15.0	11.4	14.2	2	30	24	31	95	124
St. Vrain River	44.4	41.0	40.0	13.2	9.5	13.0	1	30	23	32	98	137
Boulder Creek	39.6	38.8	40.0	11.2	10.4	12.2	2	28	27	31	109	117
Clear Creek	49.6	46.0	47.2	14.8	12.0	14.3	2	30	26	30	97	119
ARKANSAS RIVER	34.7	32.8	32.0	10.2	9.2	9.8	10	29	28	31	96	106

*Some for shorter periods. **Between Helena and Great Falls ***Above Denver, Colo.

MISSOURI AND ARKANSAS RIVER WATERSHEDS

Summary of Federal and State Cooperative Snow Surveys

Issued April 10, 1945, at Fort Collins, Colo.

No.	Main Drainage and Snow Course	Local Drainage	Location: State	Location: Locality	Location: Description	Elev.	National Forest	Apr. 1 Snow Cover Measurements: Av. Snow Depth: Av.@	Av. Snow Depth: 1944	Av. Snow Depth: 1945	Av. Water Content: Av.@	Av. Water Content: 1944	Av. Water Content: 1945
								In.	In.	In.	In.	In.	In.
	JEFFERSON RIVER												
6	Camp Creek*	Red Rock Cr.	Idaho	6mi.N.Spencer	21-13N-36E	6800	Targhee	29.5	34.7	29.1	8.6	9.3	9.1
7	Moose Creek*	N.Fk.BigHole	"	3mi.S.Gibbons P.	27-27N-21E	6200	Salmon	40.6	37.1	42.2	13.3	9.2	13.6
7	East Fork R.S.	Rock Creek	Mont.	13mi.NE.Sula	16-2N-17W	5400	Bitterroot	10.4	5.6	11.0	3.4	1.4	3.6
10	Gibbons Pass	N.Fk.BigHole	Mont.	Gibbons Pass	4-2S-19W	7100	"	56.0	53.7	59.6	19.1	14.9	16.5
30	Pipestone Pass	Pipestone Cr.	"	Pipestone Pass	11-1N-7W	7200	DeerLodge	18.9	17.0	22.2	5.0	4.6	5.1
	Elkhorn Hot Spgs.	Wise River	"	8mi.N.Polaris	15-4S-12W	8450	Beaverhead	29.3	27.2	27.6	7.6	6.4	6.0
	Picnic Grounds	Bison Cr.	"	1mi.E.Elk Park	22-5N-6W	-	DeerLodge	--	--	7.1	--	--	2.1
31	Storm Lake	Seymour Cr.	"	15mi.W.Anaconda	19-4N-13W	8100	DeerLodge	46.0	43.5	42.8	12.8	10.3	10.8
					Average for Drainage			33.0	31.3	33.5	10.0	8.0	9.2
	MADISON RIVER												
2	Aster Creek*	Firehole R.	Wyo.	Lewis Lake	44.3N110.6W	7700	Yel.Nat.P.	74.3	60.9	64.2	26.6	18.3	19.2
8	Lewis L.Divide*	" "	"	3mi.S.Lewis L.	44.2N110.7W	7900	" " "	99.0	74.2	83.8	37.7	24.4	29.9
11	Norris Basin	Gibbon River	"	Norris Basin	44.3N110.7W	7500	" " "	--	32.8	--	--	8.8	--
3	Big Springs*	South Fork	Idaho	Big Springs	34-14N-44E	6500	Targhee	42.2	51.9	53.5	18.4	15.2	16.4
16	West Yellowstone	South Fork	Mont.	W.Yellowstone	34-13S-5E	6700	Gallatin	31.8	24.4	27.4	10.4	7.1	7.3
	Twenty-one mile*	Greyling Cr.	"	8mi.S.Gallatin	1-11S-5E	7150	Yel.Nat.P.	45.3	42.6	35.5	14.9	12.0	10.0
	Hebgen Dam	Cabin Creek	"	Hebgen Dam	22-11S-3E	6550	Gallatin	34.6	28.8	28.4	11.2	7.8	8.2
	Valley View	Denny Cr.	Idaho	5mi.E.Henry's L.	7-15N-44E	6500	Targhee	43.0	40.6	38.3	13.1	10.5	10.1
					Average for Drainage			52.9	46.2	47.3	18.9	13.6	14.4
	GALLATIN RIVER												
	Devil's Slide	Hyalite Cr.	Mont.	20mi.S.Bozeman	14-5S-6E	8100	Gallatin	60.0	64.6	66.3	17.4	16.2	15.1
	Hood Meadow Extn.	" "	"	14mi." "	22-4S-6E	6600	"	27.3	36.3	30.2	7.0	8.5	6.2
	Mystic Lake No.1	Bozeman Cr.	"	12mi.SE. "	31-3S-7E	6600	"	23.5	35.7	30.0	6.7	9.6	8.2
	Mystic Lake No.2	" "	"	" " "	31-3S-7E	6600	"	23.7	35.8	26.7	6.2	8.2	6.7
	Twenty-one Mile	Gallatin River	"	8mi.S.Gallatin	1-11S-5E	7150	Yel.Nat.P.	45.3	42.6	35.5	14.9	12.0	10.0
	Ross Peak	Ross Cr.	"	12mi.N.Bozeman	10-1N-6E	7000	Gallatin	23.7	28.7	23.8	6.0	6.3	5.5
	New World Trail	Gallatin River	"	8mi.SE.Bozeman	13-3S-6E	7000	"	34.3	45.6	36.3	9.6	12.1	8.6
					Average for Drainage			34.0	41.3	35.5	9.7	10.4	8.6
	MUSSELSHELL RIVER												
	Grasshopper*	Musselshell R.	Mont.	6mi.S.W.S.Spgs.	19-9N-8E	7000	Lewis&Clark	18.8	16.1	13.5	4.5	3.9	2.9
	Orville Harris	Musselshell R.	"	12mi.E.W.S.Spgs.	31-10N-9E	6500	" "	18.6	14.1	15.6	4.8	4.6	4.0
					Average for Drainage			18.7	15.1	14.6	4.6	4.2	3.4

*Adjacent Drainage @Average for period of record

MISSOURI AND ARKANSAS RIVER WATERSHEDS

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No.	Main Drainage and Snow Course	Local Drainage	Location: State	Locality	Description	Elev.	National Forest	Apr. 1 Snow Cover Measurements: Av. Snow Depth Av.©	Av. Snow Depth 1944	Av. Snow Depth 1945	Av. Water Content Av.©	Av. Water Content 1944	Av. Water Content 1945
	MISSOURI RIVER							In.	In.	In.	In.	In.	In.
6	Chessman Res.	Tenmile	Mont.	11mi.SW.Helena	2-8N-5W	6200	Helena	15.4	14.8	16.0	4.2	3.6	3.6
11	Goat Mountain	South Fork	"	26mi.W.Gilman	47.5N112.9W	7000	Lewis&Clar	26.2	22.4	27.8	7.1	5.5	6.6
36	Stemple Pass	Canyon Creek	"	Stemple Pass	16-13N-7W	6900	Helena	30.2	31.6	37.4	7.9	6.3	9.2
41	Tenmile Cr.Lower	Tenmile	"	17mi.SW.Helena	13-8N-6W	6250	"	21.8	21.6	24.1	5.5	5.2	5.6
42	Tenmile Cr.Middle	"	"	" " "	13-8N-6W	6800	"	34.4	32.2	37.6	9.2	8.1	8.2
43	Tenmile Cr.Upper	"	"	" " "	19-8N-5W	8000	"	40.1	39.2	41.6	11.9	10.5	12.0
	Grasshopper	Grasshopper Cr.	"	6mi.S.W.S.Spgs.	19-9N-8E	7000	Lewis&Clar	18.8	16.1	13.5	4.5	3.9	2.9
	King's Hill	Belt Creek	"	21mi.N.W.S.Spgs.	35-13N-7E	7950	" "	39.5	45.6	37.0	11.1	10.9	9.5
	Orville Harris	Musselshell R.	"	12mi.E.W.S.Spgs.	31-10N-9E	6500	" "	18.6	14.1	15.6	4.8	4.6	4.0
	Half Moon	Judith River	"	19mi.S.Lewistown	22-12N-18E	6000	" "	24.3	24.8	22.3	7.5	6.7	5.4
	Crystal Lake	Flat Willow Cr.	"	18mi.SE. "	24-12N-17E	5500	" "	37.6	48.9	28.5	11.4	13.7	8.6
					Average for Drainage			28.8	28.3	27.4	7.7	7.2	6.9
	MARIAS RIVER												
7	Desert Mountain*	Cutbank Cr.	Mont.	4mi.S.Belton	24-31N-19W	5600	FlatHead	35.8	34.4	38.9	11.4	8.6	12.5
20	Marias Pass	Two Medicine	"	Summit	48.3N113.4W	5250	Glacier NF	39.5	29.0	46.0	14.0	9.4	12.5
					Average for Drainage			37.6	31.7	42.4	12.7	9.0	12.5
	YELLOWSTONE RIVER												
14	Dome Lake	Goose Creek	Wyo.	Dome Lake	11-53N-87W	8800	BigHorn		36.5			10.3	
40	Lupine Creek	Lupine Creek	"	11mi.SE.Gardiner	44.9N110.6W	7300	Yel.Nat.P.						
41	Blacktail Deer Cr	Blk.Tail Deer	"	11mi. " "	44.9N110.6W	7500	" " "						
43	Lodge Pole	Lodge Pole Cr.	"	34mi.NW.Cody	32-56N-106W	8200	Shoshone	33.2	30.2	27.4	9.8	6.9	6.8
	Camp Senia	W.Br.Rock Cr.	Mont.	10mi.W.Red Ldg.	2-8S-18E	7870	Custer	28.7	33.5	45.5	6.7	8.4	9.3
3	Canyon	Tower Creek	Wyo.	8mi.N.Canyon Jct	44.7N110.5W	7750	Yel.Nat.P.		36.9			8.5	
	Cooke City	Soda Butte Cr.	Mont.	Cooke City	25.9S-14E	7400	Absaroka		21.8			4.1	
	Crevice Mtn.#1	Yellowstone	"	6mi.E.Gardiner	26-9S-9E	8400	Yel.Nat.P.	34.8	38.4	30.2	9.6	9.2	7.3
	Crevice Mtn.#2	"	"	7mi.E. "	25-9S-9E	8200	" " "	34.7	39.6	30.1	9.5	9.3	7.2
7	Lake Camp	"	Wyo.	3mi.NE.Fish.Br.	44.6N110.4W	7850	" " "		33.8			8.0	
	Porcupine	Porcupine Cr.	Mont.	12mi.NE.Wilsall	10-4N-10E	6500	Absaroka	16.2	15.3	12.0	3.6	2.7	3.3
	Hell's Canyon	Boulder Cr.	"	26mi.SE.Livgstn	23-5S-12E	6000	"	9.4	13.5	9.6	3.5	5.3	3.5
	Independence	" "	"	26mi.NE.Gardiner	22-7S-12E	8000	"	52.6	54.6	51.2	16.0	13.5	13.8
					Average for Drainage			29.9	32.2	29.4	8.4	7.9	7.3
	MILK RIVER												
	Rocky Boy	Milk River	Mont.	Bear Paw Mt.	15-28N-16E	---	OffForest	16.6	20.1	11.8	5.6	7.1	3.1

*Adjacent Drainage ©Average for period of record

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								In.	In.	In.	In.	In.	In.
	SHOSHONE RIVER												
32	Sylvan Pass	Middle Cr.	Wyo.	Sylvan Pass	12-52N-110W	7100	Yel.Nat.P.	41.9	37.4	39.4	12.6	10.2	12.1
33	Up.Hardpan Basin	Hardpan Cr.	"	27mi.SW.Cody	25-51N-106W	9500	Shoshone	41.8	41.6	39.4	10.3	9.5	9.5
50	Brooks Lake #3*	Shoshone R.	"	Brooks Lake	23-44N-110W	9200	Washakie	60.2	56.4	52.3	18.7	16.9	17.4
					Average for Drainage			48.0	45.1	43.7	13.9	12.2	13.0
	BIGHORN RIVER												
12	Togwotee Pass	Wind River	Wyo.	Togwotee Pass	29.44N-110W	9600	Teton	74.1	71.2	69.0	26.0	20.4	26.1
13	Tensleep R.S.	Tensleep Cr.	"	15mi.NE.Tensleep	30-49N-86W	8300	Bighorn	30.7	36.1	35.5	6.7	7.2	7.3
16	Ranger Creek	Ranger Creek	"	14mi.E.Shell	32-53N-88W	8800	"	34.2	37.8	36.9	7.8	8.7	9.3
14	Dome Lake*	Shell Cr.	"	Dome Lake	11-53N-87W	8800	Bighorn		36.5	--		10.3	--
45	Sawmill Glade	Popo Agie R.	"	13mi.SW.Lander	3-31N-101W	8500	Washakie	24.3	36.0	16.4	5.8	7.5	3.6
46	Blue Ridge	" " "	"	15mi. " "	23-31N-101W	9500	"	32.8	41.9	25.7	9.0	10.6	6.8
47	South Pass	L.Popo Agie R.	"	19mi. " "	13-30N-101W	9000	"	39.3	42.5	35.8	11.1	11.6	10.1
48	Wood River	Wood River	"	42mi.SW.Cody	28-46N-103W	8000	Shoshone	19.0	23.7	12.5	5.0	6.2	3.1
49	Sheridan Cr.R.S.	#2 Sheridan Cr.	"	16mi.NW.Dubois	3-42N-109W	7500	Washakie	23.0	16.1	21.5	6.0	4.1	6.1
50	Brooks Lake #3	Wind River	"	Brooks Lake	23-44N-110W	9200	"	60.2	56.4	52.3	18.7	16.9	17.4
51	St.Lawrence R.S.	St.Lawrence Cr	"	27mi.NW.Lander	26-1N-4W	9000	Shos.I.R.		25.3	--		6.2	--
52	Mosquito Park RS	Trout Creek	"	18mi. " "	23-2S-3W	9500	" " "		41.7	--		9.5	--
53	DuNoir	Wind River	"	9mi.NW.Dubois	27-42N-108W	8760	Washakie	32.8	23.8	26.3	9.6	6.0	7.2
54	T-Cross Ranch	Horse Creek	"	12mi.N.Dubois	1-43N-107W	8000	"	23.2	14.5	12.5	7.0	3.5	3.4
					Average for Drainage			35.8	36.4	31.3	10.2	9.3	9.1
	TONGUE RIVER												
14	Dome Lake	Goose Cr.	Wyo.	Dome Lake	11-53N-87W	8800	Bighorn		36.5	--		10.3	--
17	Big Goose Cr.R.S.	E.Goose Cr.	"	20mi.SW.Sheridan	4-53N-86W	7700	"	16.2	27.2	22.9	3.7	5.1	6.3
					Average for Drainage			16.2	27.2	22.9	3.7	5.1	6.3
	POWDER RIVER												
30	Red Fork	Middle Fork	Wyo.	23mi.W.Kaycee	18-43N-85W	7500	OffForest	27.1	36.3	26.9	6.4	8.1	6.2
31	Sour Dough	Sour Dough Cr.	"	10mi.W.Klondike	17-49N-84W	8500	Bighorn	24.8	24.0	20.3	5.2	3.3	5.1
					Average for Drainage			26.0	30.2	23.6	5.8	5.7	5.6

*On adjacent drainage

@Average for period of record

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								In.	In.	In.	In.	In.	In.
	NORTH PLATTE RIVER												
1	Cameron Pass	Michigan Cr.	Colo.	Cameron Pass	2-6N-76W	10300	Roosevelt	62.0	58.3	72.0	20.2	15.6	19.2
7	Park View	Illinois Cr.	"	7mi.SE.Rand	24-5N-78W	9200	Routt	33.8	32.3	32.1	10.0	7.5	7.8
8	Columbine Lodge	Grizzly Cr.	"	Rbt.Ears Pass	21-5N-82W	9300	"	64.9	68.0	65.5	21.7	16.6	22.7
51	Big Creek Lake	Big Creek	"	5mi.SW.Pearl	9-11N-82W	9000	"		36.6	--		9.0	--
62	Willow Creek P.*	Illinois Cr.	"	Willow Cr.Pass	1-4N-78W	9500	Arapaho	42.2	37.0	41.3	12.2	8.9	11.8
7	Bottle Creek	Encmpmnt Cr.	Wyo.	7mi.SW.Encmpmnt	24-14N-85W	8200	Medicine Bow	44.5	39.9	55.0	14.2	10.4	16.9
8	Webber Spring	" "	"	10mi.S. "	27-14N-85W	9000	" "	57.2	51.6	71.7	18.8	14.9	21.2
9	Old Battle	" "	"	12mi.W. "	29-14N-85W	9800	" "	87.2	81.5	108.4	30.8	26.6	35.4
37	North French Cr.	N.French Cr.	"	Cent/Saratoga	27-16N-80W	10200	" "	82.7	87.5	96.4	29.9	20.6	33.1
38	N.Barrett Cr.#2	Barrett Cr.	"	" "	30-16N-80W	9400	" "	62.8	70.2	73.8	20.1	13.6	22.2
39	Ryan Park #2	" "	"	" "	34-16N-81W	8400	" "	39.4	42.1	49.2	11.2	8.0	14.0
					Average for Drainage			57.7	56.8	66.5	18.9	14.3	20.4
	SWEETWATER RIVER												
29	Grannier Meadows	Rock Creek	Wyo.	20mi.SW.Lander	19-30N-100W	9000	Washakie	40.1	44.7	37.4	10.8	12.3	10.2
47	South Pass	" "	"	19mi. " "	13-30N-101W	9000	"	39.3	42.5	35.8	11.1	11.6	10.1
					Average for Drainage			39.7	43.6	36.6	11.0	12.0	10.2
	LARAMIE RIVER												
3	Brooklyn Lake	Nash Fork	Wyo.	7mi.NW.Centennial	11-16N-79W	10200	MedicineBow	61.2	59.0	76.1	20.7	16.7	22.7
11	Fox Park	Fox Creek	"	Fox Park	21-13N-78W	9200	" "	34.4	40.9	51.2	9.8	9.8	13.3
34	Pole Mountain #2*	Soldier Cr.	"	10mi.SE.Laramie	35-15N-72W	8700	" "	16.0	25.7	32.2	4.5	6.0	8.1
35	Libby Lodge #2	Libby Creek	"	3mi.NW.Cntennial	29-16N-76W	8700	" "	29.4	29.4	45.2	8.4	7.3	11.4
36	Hairpin Turn #2	Nash Fork	"	5mi.NW. "	24-16N-79W	9500	" "	37.0	33.0	48.2	10.6	7.9	11.9
4	W.Port.G-P.Tunnel	Laramie R.	Colo.	4mi.N.Chambers L	7-8N-75W	8600	Roosevelt	31.4	30.1	38.7	9.3	6.9	10.5
50	Deadman Hill*	Deadman Cr.	"	10mi.W.R.Feather	26-10N-75W	10200	"	46.8	48.1	54.0	13.4	12.2	14.5
88	Roach	LaGarde Cr.	"	8mi.NW.Glendevey	5-10N-77W	9800	"	57.7	63.0	61.8	17.8	14.2	18.3
					Average for Drainage			39.2	41.1	50.9	11.8	10.1	13.8

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								In.	In.	In.	In.	In.	In.
	CHEYENNE RIVER												
1	Upper Spearfish	Spearfish Cr.	S.Dak.	21mi.SW.Spearfish	21-3N-1E	6500	BlackHills	33.6	37.5	29.6	8.4	9.2	7.6
2	Upper Castle	Castle Cr.	" "	11mi.NW.Deerfield	24-2N-1E	6800	" "	33.0	37.0	29.1	7.9	9.2	6.6
3	Deerfield	Silver Cr.	" "	3mi.NW.Deerfield	23-1N-2E	6010	" "	15.9	22.8	9.0	4.3	6.2	2.4
					Average for Drainage			27.5	32.4	22.6	6.9	8.2	5.5
	SOUTH PLATTE RIVER												
14	Hoosier Pass	S.Platte R.	Colo.	Hoosier Pass	13-8S-78W	11400	Pike	41.1	34.4	29.6	11.5	7.9	7.7
15	Fairplay	" " "	"	Fairplay	33-9S-77W	10000	"	3.6	6.8	T	0.6	1.1	T
83	Jefferson Cr.#2	Jefferson Cr.	"	5mi.NW.Jefferson	14-7S-76W	10100	"	22.2	32.0	27.0	5.5	7.4	6.8
					Average for Drainage			22.3	24.4	18.9	5.9	5.5	4.8
	CROW CREEK												
34	Pole Mountain #2	Crow Creek	Wyo.	10mi.SE.Laramie	35-15N-72W	8700	Medicine Bow	16.0	25.7	32.2	4.5	6.0	8.1
	POUDRE RIVER												
1	Cameron Pass	JoeWright Cr.	Colo.	Cameron Pass	2-6N-76W	10300	Roosevelt	62.0	58.3	72.0	20.2	15.6	19.2
2	Chambers Lake	Poudre River	"	Chambers Lake	6-7N-75W	9000	"	24.2	20.5	35.0	7.4	5.0	8.2
3	Big South	" "	"	2mi.E.Chambers L.	33-8N-75W	8600	"	9.4	10.9	15.6	2.4	1.9	3.5
50	Deadman Hill	N.Poudre R.	"	10mi.W.R.Feather	26-10N-75W	10200	"	46.8	48.1	54.0	13.4	12.2	14.5
65	Lake Irene*	Big S.Poudre	"	1mi.SW.Milner P.	8-5N-75W	10600	Ry.Mtn.N.P.	61.9	59.9	55.9	19.5	14.4	17.8
68	Hour Glass Lake	L.S.Poudre	"	2mi.NW.Pingree P.	18-7N-73W	9500	Roosevelt			--			--
					Average for Drainage			40.9	39.5	46.5	12.6	9.8	12.6
	BIG THOMPSON												
65	Lake Irene*	BigThompsonR.	Colo.	1mi.SW.Milner P.	8-5N-75W	10600	Ry.Mtn.N.P.	61.9	59.9	55.9	19.5	14.4	17.8
95	Hidden Valley #2	Hidden Val.Cr.	"	9mi.W.Estes P.	23-5N-74W	9550	" " " "	38.5	35.4	36.4	10.6	8.4	10.5
					Average for Drainage			50.2	47.6	46.2	15.0	11.4	14.2

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								In.	In.	In.	In.	In.	In.
	ST. VRAIN RIVER												
41	Wild Basin	N.St.Vrain R.	Colo.	5mi.W.Allens P.	24-3N-74W	10000	Ry.Mtn.N.P.	44.4	41.0	40.0	13.2	9.5	13.0
	BOULDER CREEK												
5	E.Port.Moffat T.	S.Boulder Cr.	Colo.	East Portal	2-2S-74W	9400	Roosevelt	11.7	17.6	21.4	3.1	4.1	4.8
60	UniversityCamp#2	N.Boulder Cr.	"	5mi.SW.Ward	28-1N-73W	10300	"	57.6	60.1	58.7	19.2	16.6	19.5
					Average for Drainage			39.6	38.8	40.0	11.2	10.4	12.2
	CLEAR CREEK												
61	Loveland Pass #2	Clear Creek	Colo.	10mi.W.Georgetwn	27-4S-76W	10100	Arapaho	45.8	44.5	44.0	13.3	11.4	13.3
97	Grizzly Peak*	" "	"	1mi.W.Loveland P.	2-5S-76W	11250	"	53.5	47.6	50.3	16.3	12.7	15.3
					Average for Drainage			49.6	46.0	47.2	14.8	12.0	14.3
	ARKANSAS RIVER												
19	Tennessee Pass	Tennessee Cr.	Colo.	Tennessee Pass	21-8S-80W	10200	San Isabel	34.4	30.3	25.5	9.0	8.2	6.9
21	Twin Lakes Tun.	Lake Creek	"	9mi.W.Twin Lakes	22-11S-82W	10500	" "	35.8	32.2	22.7	9.7	8.3	7.2
42	Marshall Creek*	Poncha Cr.	"	Marshall Pass	24-48N-6E	10800	Gunnison	45.8	41.9	41.3	13.7	12.1	13.2
43	Poncha Creek	" "	"	" "	19-48N-7E	10500	San Isabel	37.5	33.6	37.2	11.6	10.4	11.7
72	Whiskey Creek #2	Whiskey Cr.	"	Whiskey Cr.Pass	37.2N105.2W	10300	MaxwellGr.	24.5	21.2	22.6	7.3	7.2	7.2
74	LaVeta Pass #2*	Cuchara Cr.	"	LaVeta Pass	22-28S-70W	9300	SanCristoGr	26.8	30.4	33.4	8.0	9.8	11.4
78	Four Mile Park#2	Lake Creek	"	3mi.SW.Twin L.	23-11S-81W	9700	San Isabel	10.4	17.4	5.0	2.8	4.4	1.5
79	Fremont Pass #2	E.Fork Ark.R.	"	Fremont Pass	2-8S-79W	11400	Arapaho	52.1	43.3	50.6	15.7	10.9	12.5
81	Blue Lakes #2	Cuchara Cr.	"	15mi.SW.LaVeta	30-31S-69W	10000	San Isabel	22.4	22.5	29.8	6.1	6.2	9.1
92	Monarch Pass	S.Fork Ark.R.	"	Monarch Pass	16-49N-6E	10500	San Isabel	57.7	55.2	51.8	18.2	14.5	17.1
99	Torres	S. Fork Purg.R.	"	1 mi.W.Torres	22-34S-69W	--	MaxwellGr.		--	0.0		--	0.0
					Average for Drainage			34.7	32.8	32.0	10.2	9.2	9.8

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The following organizations cooperate in the snow surveys and irrigation water supply forecasts for the Colorado, Missouri-Arkansas and Rio Grande watersheds by furnishing funds or services.

STATE
- Colorado State Engineer
- Wyoming State Engineer
- Utah State Engineer
- New Mexico State Engineer
- Montana State Engineer
- Nebraska State Engineer
- Colorado Experiment Station
- Colorado Extension Service
- Montana Experiment Station
- Utah Experiment Station

FEDERAL
- Department of Agriculture
  - Forest Service
  - Soil Conservation Service
- Department of Interior
  - Bureau of Reclamation
  - Indian Service
  - Geological Survey
  - National Park Service
- Department of Commerce
  - Weather Bureau
- War Department
  - Army Engineer Corps

PUBLIC UTILITIES
- Colorado Public Service Company
- Western Colorado Power Company
- Montana Power Company
- Denver and Rio Grande Western R. R. Company

MUNICIPALITIES
- City of Bozeman
- City of Denver
- City of Boulder

WATER USERS ORGANIZATIONS
- Poudre Valley Water Users' Association
- Arkansas Valley Ditch Association
- Colorado River Water Conservation District

IRRIGATION PROJECTS
- Farmers Reservoir and Irrigation Company
- San Luis Valley Irrigation District
- Santa Maria Reservoir Company
- Costilla Land Company
- Uncompahgre Valley Water Users' Association
- Wyoming Development Company
- Goshen Irrigation District
- Kendrick Project
- Pathfinder Irrigation District
- Salt River Valley Water Users' Association
- San Carlos Irrigation and Drainage District

Many other organizations and individuals furnish valuable information for the snow survey reports. Their cooperation is gratefully acknowledged.